Low-Cost, Space-Worthy, Read-Out Electronics For Transition-Edge Sensors

Completed Technology Project (2013 - 2015)

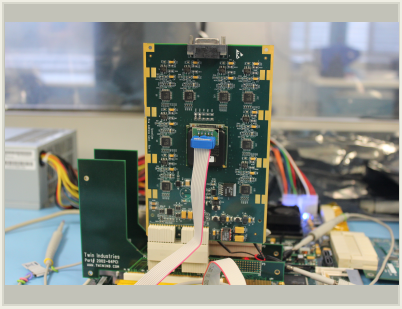
Project Introduction

For a mission utilizing X-ray microcalorimeters to be selected in the near future, it is critical not only that the key technologies be at the very highest technical readiness levels (TRL), but that the cost and schedule for building the instrument be well known and affordable. In recent years, GSFC has developed the SpaceCube 2.0. If we can utilize this high-TRL product, we will have digital read-out electronics that is small, low-mass, and dissipates low power. We will demonstrate that this technical approach is feasible when used in conjunction with our high-performance, low-temperature, superconducting transition-edge sensor (TES) X-ray microcalorimeters, and investigate the limits of the number of read-out channels that can be accommodated by each SpaceCube.

In carrying out this development, we will learn valuable details about a complex system design that will enable us to accurately determine the development cost and schedule for a flight implementation. By the end of the year, we will have demonstrated a fully realized system – including a defined grounding scheme, a filtering and isolation strategy, and a viable power distribution strategy. These components are crucial to demonstrating low noise operation of these electronics. Though all development work will take place on inexpensive prototypes, once the electronics have been successfully demonstrated, we will use an actual SpaceCube in a final demonstration. The technical readiness of the integrated Detector System, using radiation-tolerant, flight-worthy, read-out components, would be significantly increased.

Anticipated Benefits

This technology could be part of NASA's planned contribution to the European mission ATHENA. It would be part of all potential missions utilizing TES microcalorimeter and bolometers such DIOS, SAHARA, and SMART-X.



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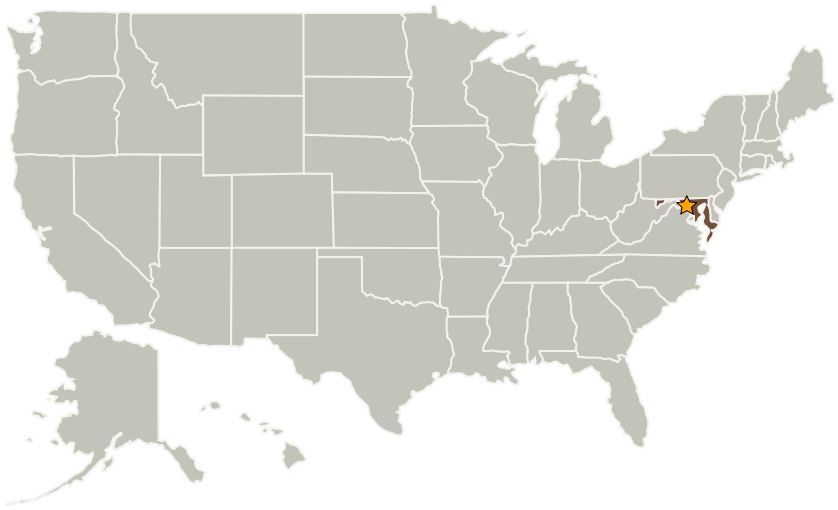
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
University of Maryland-College Park(UMCP)	Supporting Organization	Academia	College Park, Maryland

Primary U.S. Work Locations
Maryland

Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Center Independent Research & Development: GSFC IRAD

Project Management

Program Manager:

Peter M Hughes

Project Manager:

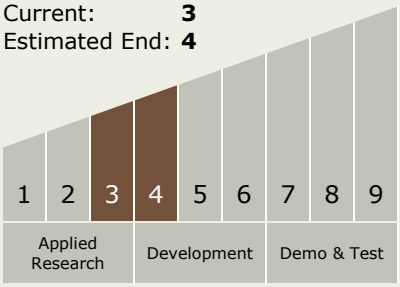
Stanley D Hunter

Principal Investigator:

Simon R Bandler

Technology Maturity (TRL)

Start: **3**
Current: **3**
Estimated End: **4**



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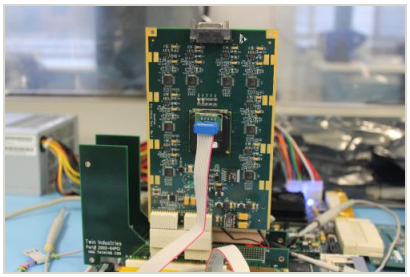
Images



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Low-Cost, Space-Worthy, Read-Out Electronics For Transition-Edge Sensors Project
(https://techport.nasa.gov/image/16474)

Links

NTR 1436811472
(no url provided)

Project Website:

http://sciences.gsfc.nasa.gov/sed/

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes